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HOW I DO IT

Prevention of Recurrent Giant-Cell Tumors of Long Bones—A New Surgical Technique

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INTRODUCTION

A giant-cell tumor of the long bones is an infrequent occurrence, with unpredictable biological "behavior" in terms of local aggressiveness, or spread to distant sites. The tumor is often highly aggressive locally, yet distant lung metastasis occurs in 2%–10% of patients. The goals of treatment are eradication of the tumor, preservation of limb function, and prevention of local recurrence and distant metastasis.

Several adjuvant methods beyond simple curettage to prevent local recurrence have been reported in the orthopaedic literature during the last decade, that is, use of high-speed burr, cryosurgery, phenol cauterization, and methyl methacrylate. In difficult locations, such as the spine, local radiation is often employed [1–3]. Nevertheless, the average reported rate of local recurrence is still 10%–20% (range 0% to 45%) [2,4–6].

On the assumption that recurrence is an indicator that some tumor cells remain within the bony cavity after initial surgery, we developed a simple, intraoperative method to reassure the surgeon that sufficient neighboring bone has been uniformly removed and that no islands containing tumor cells have remained.

SURGICAL TECHNIQUE

Prior to testing our technique in the operating room, a cadaveric distal femur was obtained and a cavity, similar to the one produced after tumor curettage, was formed. The cavity was filled to its brim with methylene blue and rinsed with normal saline. The bone was then sliced, demonstrating uniform permeation of dye to a steady depth of about 2 mm, producing a distinct "blue halo" (Fig. 1). The surface of the cavity remained blue until all the dye-containing bone was burred away. In living bone, this "halo" does not disappear with circulation.

At surgery, a large, cortical "window" is made to facilitate complete direct visualization of the entire tumor

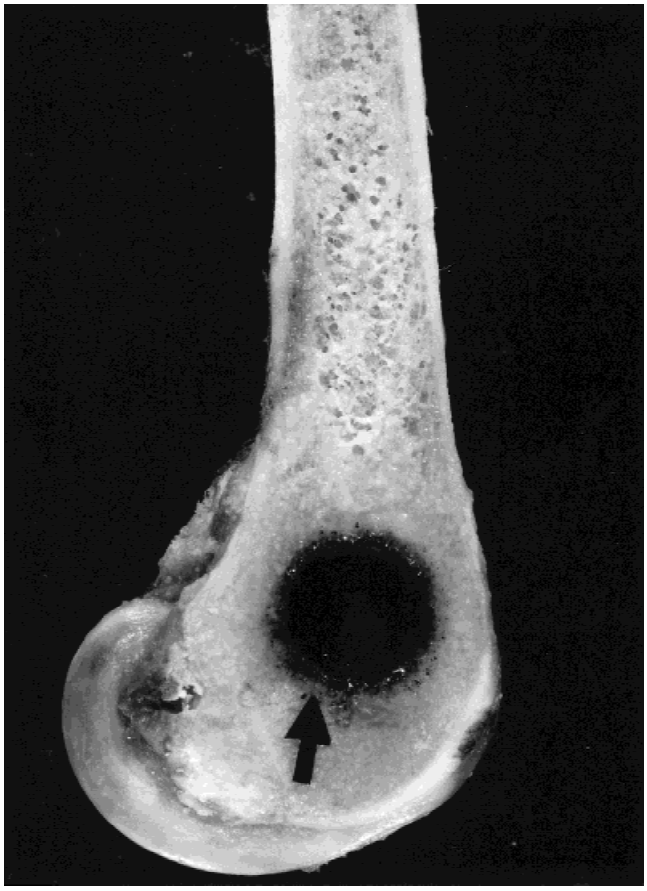

Fig. 1. "Halo" of methylene blue in a bone model.

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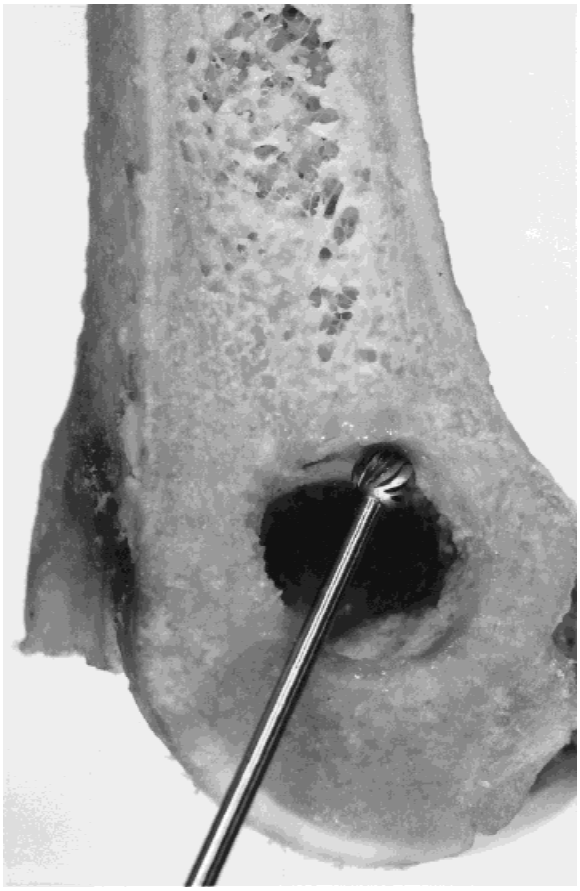

Fig. 2. The "halo" is curetted by a high-speed burr.

cavity. The tumor is manually scraped with a curette; then the complete tumoral cavity is filled with methylene blue to its brim, left for 2 min, and meticulously curetted with a high-speed burr until no bluish colour is seen within the cavity (Fig. 2). This procedure is repeated twice. The cavity is then washed, rinsed, and manually packed with methyl methacrylate. For cases in which the margins are close to the articular cartilage, a layer of iliac bone autograft slices is placed subchondrally prior to cementation.

RESULTS

Using our method, we treated 16 patients who suffered from giant-cell tumor of long bones (Table I). At an average of 39 months of follow-up, there were no recurrences and the patients resumed good function. Although ours is a relatively small series, these promising results call for the additive use of this method in patients with giant-cell tumors, as well as in other frequently recurrent tumors, such as aneurysmal bone cysts.

COMMENTARY

The paper by Salai and Rahamimov is an ingenious technique of ensuring a 6-mm uniform margin around the area of curettage for giant-cell tumor of the bone. Without the aid of this technique, the surgeon performs the initial curettage to ensure an adequate margin. However, one never quite knows how much depth one has obtained after the initial curettage or if the extra margin is indeed uniform around the initial bone cavity after the initial curettage, which achieves elimination of the gross tumor. The authors of this technique apply methylene blue in the cavity which penetrates and colors 2 mm of the bone; after curettage of the colored zone, they apply the dye two additional times with curettage each time of the colored zone. Thus they can assuredly obtain a 6-mm margin in the bone.

TABLE I. Patients With Giant-Cell Tumors of Long Bones

Case no.	At surgery		Tumor site	Tumor grade	Length of follow-up (months)
	Sex	Age			
1	F	24	Distal femur	III	43
2	F	23	Distal femur	I	38
3	M	31	Distal femur	II	35
4	M	47	Distal femur	II	41
5	M	19	Proximal tibia	III	40
6	F	36	Proximal tibia	II	34
7	F	42	Proximal tibia	II	35
8	M	29	Proximal tibia	II	34
9	M	17	Proximal tibia	II	36
10	M	47	Proximal femur	I	35
11	F	27	Proximal femur	II	34
12	M	30	Proximal humerus	II	36
13	F	42	Distal radius	II	38
14	F	19	Distal tibia	II	35
15	F	48	Proximal tibia	III	37
16	M	16	Proximal femur	III	38

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